Misc. Publication A22

THE KENT INCORPORATED SOCIETY
FOR PROMOTING EXPERIMENTS IN
HORTICULTURE

SUPPLEMENTARY
ANNUAL REPORT

(TWENTY-SIXTH YEAR)

GENERAL DEVELOPMENT AND ACTIVITIES

EAST MALLING RESEARCH STATION

Near MAIDSTONE

KENT

1st January, 1938, to 31st December, 1938

Published May, 1939

GOVERNING MEMBERS OF THE SOCIETY

Appointed by the Ministry of Agriculture:

Sir FREDERICK W. KEEBLE, Kt., C.B.E., D.Sc., F.R.S., Cedron House, Fowey, Cornwall.

Appointed by the Kent County Council:

ED. HARDY, Esq., C.C., Boughton Court, Ashford, Kent.

Sir OSMOND E. D'AVIGDOR GOLDSMID, Bt., D.L., J.P., M.A., LL.B., Somerhill, Tonbridge, Kent.

W. J. THOMAS, Esq., Brownings, Rodmersham, Kent.

Appointed by the Surrey County Council:

S. S. BOORMAN, Esq., Heath Farm, Send, Woking, Surrey.

Appointed by the East Sussex County Council:

E. S. ATTRELL, Esq., Warren Fruit Farm, North Common, Chailey, Sussex.

Appointed by the West Sussex County Council:

Gen. Sir IVOR MAXSE, K.C.B., C.V.O., D.S.O., F.R.G.S., Little Bognor, Fittleworth, Sussex.

Appointed by the Council of the Senate of the University of Cambridge:

Professor Sir ROWLAND H. BIFFEN, M.A., F.R.S., School of Agriculture, Cambridge.

Appointed by the Senate of the University of London:

Professor Dame HELEN GWYNNE-VAUGHAN, G.B.E., D.Sc., LL.D., F.L.S., 93 Bedford Court Mansions, London, W.C.1. (*Resigned October,* 1938.)

Professor WM. BROWN, D.Sc., F.R.S., 93 Church Road, Hanwell, London, W.7. (*Appointed October,* 1938.)

Appointed by the University of Bristol:

Professor B. T. P. BARKER, M.A., The Research Station, Long Ashton, near Bristol.

Appointed by the Governing Body of the Imperial College of Science and Technology:

Professor V. H. BLACKMAN, Sc.D., F.L.S., F.R.S., Imperial College, South Kensington, London, S.W.7.

Appointed by the Council of the Royal Society:

Professor E. J. SALISBURY, D.Sc., F.L.S., F.R.S., University College, Gower Street, London, W.C.1.

Appointed by the Governors of the South-Eastern Agricultural College, Wye:

ED. HARDY, Esq., C.C., Boughton Court, Ashford, Kent.

Rt. Hon. Lord NORTHBOURNE, C.C., Northbourne Court, Deal, Kent.

Appointed by the Research and Advisory Committee of the South-Eastern Agricultural College, Wye:

R. M. WILSON, Esq., B.Sc.Agric., South-Eastern Agricultural College, Wye, Kent.

Appointed by the Governors of John Innes Horticultural Institution:

Sir DANIEL HALL, K.C.B., M.A., F.R.S., LL.D., John Innes Horticultural Institute, Merton, Surrey.

Appointed by the Council of the Royal Horticultural Society:

E. A. BUNYARD, Esq., F.L.S., The Royal Nurseries, The Broadway, Maidstone, Kent.

Appointed by the Council of the Institute of Brewing:

T. E. GRANT, Esq., Messrs. Mitchells & Butlers, Ltd., Cape Hill Brewery, Birmingham.

Appointed by the Research Fund Committee of the Institute of Brewing:

G. T. COOK, Esq., Queen's Avenue, Maidstone, Kent.

Appointed by the National Farmers' Union (Central Council, London):

J. S. CHIVERS, Esq., Messrs. Chivers & Sons, Ltd., Histon, Cambridge.

J. E. SANDALL, Esq., Beechwood, Clarkson Avenue, Wisbech, Cambs.

Appointed by the National Farmers' Union (Kent Branch):

A. AMOS, Esq., Spring Grove Farm, Wye, Kent.

ALFRED DAY, Esq., J.P., Great Tong Farm, Headcorn, Kent.

S. R. DIXON, Esq., Cambridge, Teynham, Sittingbourne, Kent.

W. T. EDMONDS, Esq., Allington Farm, Maidstone, Kent.

P. MANWARING, Esq., J.P., King Edwards Parade, Eastbourne, Sussex.

Sir AMBERSON B. MARTEN, Kt., M.A., LL.D., Gedges, Matfield, Paddock Wood, Kent.

D. J. MOOR, Esq., Nichol Farm, Teynham, Kent.

S. W. MOUNT, Esq., Hode Farm, Patrixbourne, Canterbury, Kent.

T. NEAME, Esq., The Offices, Macknade, Faversham, Kent.

J. A. RAYNHAM, Esq., Dairy Farm, Marden, Kent.

J. M. ROBERTSON, Esq., Beluncle, Hoo, Rochester, Kent.

J. F. TOWNER, Esq., Salts Farm, Loose, near Maidstone, Kent.

Appointed by the Council of the Horticultural Trades' Association:

L. J. COOK, Esq., 7 Drapers Road, Enfield, Middlesex.

Appointed by the Associate Members of East Malling Research Station:

A. T. MILLER, Esq., Wested Farm, Swanley, Kent.

Capt. R. WELLINGTON, Worth, Hele, Bradninch, S.O., Devon.

MEMBERS OF THE EXECUTIVE COMMITTEE

(Governing Members elected at the General Meeting, June 1936)

Professor B. T. P. BARKER, M.A.
Professor V. H. BLACKMAN, Sc.D., F.R.S., F.L.S. (Vice-Chairman).
S. S. BOORMAN, Esq.
Professor WM. BROWN, D.Sc., F.R.S. (*Appointed October*, 1938.)
G. T. COOK, Esq.
J. S. CHIVERS, Esq.
L. J. COOK, Esq.
ALFRED DAY, Esq., J.P.
W. T. EDMONDS, Esq.
Professor Dame HELEN GWYNNE-VAUGHAN, G.B.E., D.Sc., LL.D., F.L.S. (*Resigned October*, 1938.)
Sir DANIEL HALL, K.C.B., M.A., F.R.S., D.Sc., LL.D.
P. MANWARING, Esq., J.P.
S. W. MOUNT, Esq. (Chairman).
Rt. Hon. Lord NORTHBOURNE, C.C.
T. NEAME, Esq. (Chairman, Finance Sub-Committee).
J. M. ROBERTSON, Esq.
Professor E. J. SALISBURY, D.Sc., F.L.S., F.R.S.
J. E. SANDALL, Esq.
W. J. THOMAS, Esq.
Capt. R. WELLINGTON.

Co-opted Members:

H. V. TAYLOR, Esq., O.B.E., D.Sc.(Lond.), A.R.C.S.
Horticultural Commissioner, Ministry of Agriculture.
W. ROGERS, Esq., Court Lodge, Horton Kirby, Kent.

The Director:

R. G. HATTON, Esq., C.B.E., M.A.(Oxon.), D.Sc.(Lond.), V.M.H.

The Representative of Staff Council:

M. H. MOORE, Esq., Dip.Hort.Sci.(Reading).

STAFF

Director : RONALD G. HATTON, C.B.E., M.A.(Oxon.), D.Sc.Hort.(Lond.), V.M.H.

Assistant Director : H. WORMALD, D.Sc.(Lond.), A.R.C.S., D.I.C.

Technical Officer : N. B. BAGENAL, B.A.(Cantab.).

Assistant : B. F. G. LEVY, B.A.(Cantab.), Hort.Cert.(Reading). (*Appointed December,* 1938.)
H. B. S. MONTGOMERY, B.A.(Dublin), Ph.D.(Lond.), D.I.C. (*Part time.*)

Pomology : R. G. HATTON,* C.B.E., M.A.(Oxon.), D.Sc.(Lond.), V.M.H.
N. H. GRUBB, M.S.A.(Cornell).
W. S. ROGERS, M.A., Ph.D.(Lond.), Dip.Hort.(Cantab.).
J. AMOS, N.D.H.
W. A. BANE, B.Sc.Hort.(Reading).
Miss A. B. BEAKBANE, B.Sc.Hort.(Lond.), N.D.H.
Miss C. P. FIELD, B.Sc.Hort.(Reading).
Miss E. C. THOMPSON.
Lab. and Field Assistants : C. H. W. SLATER.
Miss E. C. M. ASHDOWN.
Miss F. M. HODGE.
Miss M. E. J. BROAD.
Miss M. STEVENSON.

Plant Breeding : H. M. TYDEMAN.

Propagation : R. J. GARNER, N.D.H., Dip.Hort.Sci.(Reading).
D. H. HAMMOND.

Marketing Investigations : A. C. PAINTER.
Lab. Assistant : R. A. WARD. (*Resigned October,* 1938.)

Hops : F. H. BEARD, Hort.Dip.(Wye).

Walnuts : A. W. WITT, N.D.H. (*Consultant*).

Statistics : T. N. HOBLYN,* Hort.Dip.(Wye).
S. C. PEARCE, B.Sc.(Lond.).
Miss J. S. PLACKETT.
Lab. Assistant : W. A. J. BOURNE.

Plant Physiology : M. C. VYVYAN,* M.A.(Cantab.).
H. L. PEARSE, Ph.D.(Lond.), A.R.C.S., D.I.C., of the Imperial College of Science and Technology.
Lab. Assistant : G. F. TROWEL.

* Recognized Teacher of the University of London.

Bio-Chemistry : W. A. ROACH,* D.Sc.(Lond.), A.R.C.S., D.I.C., A.I.C.
J. K. EATON, B.Sc.(Wales), M.Sc.Tech.(Manc.).
Lab. Assistant : R. BLUNDEN.

Mycology and Bacteriology : H. WORMALD,* D.Sc.(Lond.), A.R.C.S., D.I.C.
R. V. HARRIS, B.Sc.(Lond.), A.R.C.S., D.I.C.
H. B. S. MONTGOMERY, B.A.(Dublin), Ph.D.(Lond.), D.I.C. (*Part time.*)
Miss M. E. KING, B.A.(Cantab.), *Special Assistant, Virus Diseases.*
W. G. KEYWORTH, B.Sc., A.R.C.S., *Special Assistant, Hop Diseases.*
Lab. Assistant : R. HUMPHREYS.

Entomology : A. M. MASSEE,* D.Sc.(Lond.), F.R.E.S.
R. M. GREENSLADE, B.Sc., A.R.C.S.
G. H. L. DICKER, B.Sc., A.R.C.S., *Special Assistant, Pests of Raspberry, Blackberry and Loganberry.*
Lab. Assistant : F. CRONK.

Insecticides and Fungicides :

Chemistry : H. SHAW, M.Sc.Tech., Ph.D.(Manc.).
Lab. Assistant : R. N. PIERCE.

Entomology : W. STEER, B.A.(Cantab.)
R. G. GAMBRILL, *Recorder.*

Mycology : M. H. MOORE, Dip.Hort.Sci.(Reading).
Lab. Assistant : J. JEFFERYS.

Meteorological Investigations : C. E. CORNFORD, B.Sc., A.R.C.S.

Guide Demonstrator and Exhibitions Officer : H. C. CHAPELOW, *Meteorological Records.*

Photographer : Miss K. E. CORNFORD.

Lab. Stewards : Miss K. E. CORNFORD.
R. G. GAMBRILL.

Advisory Officers in Commercial Fruit Growing to the Kent Education Committee stationed at East Malling Research Station : W. G. KENT, N.D.H., and C. R. THOMPSON.

* Recognized Teacher of the University of London.

ADMINISTRATION.

Secretary : C. T. ROYLE.

Book-keeper : P. R. WOOD.

Director's Personal Secretary : Miss L. E. ALEXANDER.

Clerical Staff : Miss G. O. ARDAGH, Miss J. BANKS, Miss J. M. COY, Miss J. M. CRAYFORD, Miss H. D. GILMORE, Miss J. D. MARTIN and Miss M. I. SUNNUCK.

VISITORS.

Visits may be paid to the Research Station on any weekday *by appointment* (Saturday afternoon under exceptional circumstances only).

Passenger Station : East Malling Halt (Southern Railway).

Goods Station : Aylesford (Southern Railway).

Bus Services :

FROM MAIDSTONE by the Maidstone and District Motor Services Limited, every 20 minutes from Maidstone to East Malling Church.

FROM LONDON a regular service of Maidstone and District Coaches from the London Coastal Service Limited, Victoria Coach Station, Buckingham Palace Road, S.W.1, may be of assistance to Visitors. The Coaches call at East Malling on certain inward and outward journeys.

For Visitors coming by road DITTON CORNER on the main London-Maidstone Road is the turning to the Research Station.

Telephone : Aylesford 7294 (2 lines).

Telegrams : Research, East Malling.

THE IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS

accommodated at East Malling Research Station.

STAFF.

Director : RONALD G. HATTON, C.B.E., M.A.(Oxon.), D.Sc.(Lond.), V.M.H.

Deputy Director : D. AKENHEAD, M.A.(Oxon.), B.Sc.Agric.(London.)

Assistants : G. ST. CLAIR FEILDEN, B.A.(Oxon.)
B. VON HEISELER, F.I.L.

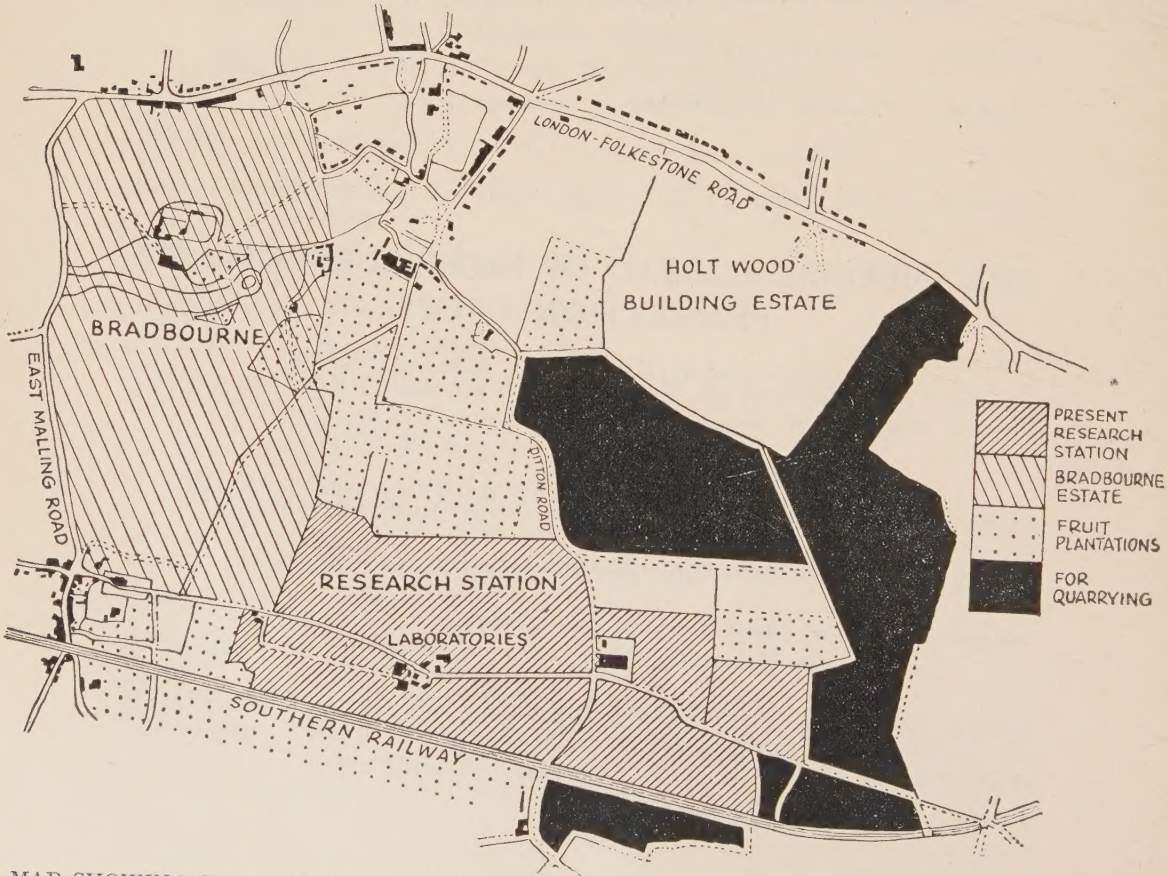
Clerical Staff : Miss M. B. ROGERS, Miss M. M. DURLING, and Miss F. R. L. CLEGGATT.

Telephone : Aylesford 7188.

BRADBOURNE PROPERTY

(Purchased June, 1938)

BRADBOURNE HOUSE. West and South View.



MAP SHOWING SITUATION OF BRADBOURNE FARM AND EAST MALLING RESEARCH STATION
Together with the Surrounding Building and Industrial Developments.

GENERAL DEVELOPMENT AND ACTIVITIES

EDITORIAL.

The Twenty-sixth Supplementary Annual Report fully records one of the most important developments in the history of the Research Station. In acquiring a new farm and ample building accommodation which can be gradually developed for all future requirements, the Committee has by the purchase of Bradbourne dispelled the great anxiety caused by the rapid industrialization of the neighbourhood. As soon as the necessary adaptations can be put in hand it will also have found means of relieving the general congestion which was beginning seriously to react upon many of the Station's activities. Though the fruitgrowing industry has generally experienced a bad year, the way in which the Institute's old friends have rallied to its support is most encouraging both to the Committee and Staff. The acquisition and preservation of Bradbourne has also brought many new friends whose interest is heartily welcomed. The remainder of this report bears witness to the fact that activities are usefully expanding and that year by year a wider circle of people is becoming acquainted with the results of our investigations. Special assistance and additional new equipment have made it possible to accelerate and intensify research work upon the virus diseases of small fruits and the virus and fungous diseases of hops. Postgraduate assistance has been especially helpful in developing the work on spectroscopic analysis in the Bio-Chemical Section.

OBITUARY.

We record with great regret the death in May of Mr. M. J. R. Dunstan, M.A., F.R.S.E., O.B.E., who, while Principal of Wye College, was so largely instrumental in founding the Wye College Fruit Experiment Station, which developed, under Mr. P. Manwaring's chairmanship, into East Malling Research Station. A short appreciation of Mr. Dunstan's work is appearing in the Annual Report.

COMMITTEES.

This report completes the third year of office of the present Governing Body and Executive Committee, the renomination of which takes place after the Annual General Meeting of 1939.

We are very sorry to report that during the latter part of last year our former Chairman, Mr. Percy Manwaring, was ordered a complete rest. He was, however, able to give his advice and encouragement to the Bradbourne Scheme. We wish him a speedy recovery.

PRESENTATION TO MR. PERCY MANWARING.

As all our Associate Members are aware, there was a general feeling that some presentation should be made to Mr. Manwaring as an expression of the general esteem in which he was held and as a mark of appreciation of his invaluable work on behalf of our Institute. It was also hoped to establish at the Station some permanent reminder of his labours. After all the circumstances were reviewed, it was decided to present

Mr. Manwaring with a gold watch and chain, inscribed : " Percy Manwaring, Chairman of East Malling Research Station, 1919-1936. With affectionate regard from the Committee, Associate Members and Staff." This was sent to him at Christmas, together with a bound list of the names of the donors. He wrote to the Director thanking " all those who have so handsomely acknowledged my past services to East Malling. I can assure you that their kindness is most highly appreciated and I trust you will in some way let the contributors know how deeply I do value their most handsome gift."

The painting of Mr. Manwaring's portrait, which is to hang in the Institute's Committee Room, has been undertaken by Mr. Murray Urquhart, R.B.A. This is now completed and it is hoped that it will be available for inspection at the Annual General Meeting.

We received with sincere regret a notification from Professor Dame Helen Gwynne-Vaughan that, owing to her duties in connection with National Defence, she felt unable to continue on the Governing Body as a representative of the University of London. Dame Helen has been associated with East Malling since 1932 and we are indebted to her for invaluable help, especially on the Post-graduate and Staff Sub-committee.

We welcome Professor William Brown, D.Sc., F.R.S., Director of the Botany Department of the Imperial College of Science and Technology, South Kensington, who has been nominated by the University to the Governing Body and Executive Committee in her place.

Twenty-four Committee Meetings were held during the year, five being Executive Meetings.

Executive Committee.

Mr. S. W. Mount was unanimously re-elected Chairman for the ensuing year, and Professor V. H. Blackman, Vice-Chairman and Mr. T. Neame re-elected Chairman of Finance. Mr. W. Rogers, of Horton Kirby, was co-opted for the year, and Mr. M. H. Moore re-elected by the Staff Council as Staff Representative on the Executive Committee.

The Committee, realizing the urgent need for safeguarding the future development of the Station, has spent much time on problems connected with the acquisition of the Bradbourne Estate. A special Bradbourne Sub-Committee was appointed and, as the result of its deliberations, the Committee made application to the Ministry of Agriculture for a £ for £ grant on £34,000 to assist in the purchase and adaptation of Bradbourne and the surrounding 200 acres of land. The Ministry has already approved the scheme, and has granted £ for £ on the purchase price. While it has promised similarly to assist in the work of adaptation, it is still considering the details of these proposals.

Extraordinary General Meeting.

Knowing the necessity for prompt action in securing the property, the Executive Committee were obliged to take full responsibility, but they summoned an Extraordinary General Meeting at the earliest possible moment (April) to show the Governing Members the Estate and to obtain confirmation of the action taken. This was unanimously given.

SUB-COMMITTEES.

Bradbourne Sub-Committee (Chairman, Mr. S. W. Mount). As already reported, the main work of the year was with regard to Bradbourne and, in order that the Sub-Committees might work closely together, a special Bradbourne Sub-Committee was formed consisting of the Chairmen of the Executive, the Finance and Building Sub-Committees, together with Mr. J. M. Robertson and Mr. W. J. Thomas. This Sub-Committee dealt with all aspects, considering detailed plans for adaptation and the preparation of estimates for the Ministry.

The Finance Sub-Committee (Chairman, Mr. T. Neame) met on four occasions and was concerned with the routine matters in connection with the Station's finance.

The Buildings Sub-Committee (Chairman, Mr. W. Talbot Edmonds) met in February to consider the proposed extension to the E.M.B. Building, but action was subsequently deferred when the Bradbourne Estate came on to the market. The Sub-Committee saw the satisfactory completion of an Insectary and Glasshouse for Virus work, and of the connection of the Station's drains to the main sewer.

The Postgraduate and Staff Sub-Committee (Chairman, Professor V. H. Blackman) met in November and received a report relating to graduate students, and discussed certain staff matters, particularly in connection with Superannuation. They considered the report from the Inspectors of the University of London after their visit in November 1937. Recommendations were made with regard to increasing library and general laboratory facilities and the establishment of a workshop.

A Special Sub-Committee, consisting of the Chairman, the Chairmen of Finance and of the Postgraduate and Staff Sub-Committee, with Sir Daniel Hall and Captain R. Wellington, met to consider the question of salaries of non-graded workers, especially laboratory and field assistants. It made recommendations for the consideration of the Ministry of Agriculture.

The Plant Prices Sub-Committee (Chairman, Mr. W. Talbot Edmonds). Through the kindness of the Royal Horticultural Society, the annual meeting of this Sub-Committee was held in May in the Society's Board Room in London. Prices were recommended for the surplus experimental material for distribution.

The Hop Sub-Committee (Chairman, Mr. Arthur Amos). The Committee accepted with regret the resignation of Mr. William Colthup. Mr. T. E. Grant, on becoming President of the Institute of Brewing for 1938, took the place of Mr. C. E. W. Charrington on this Sub-Committee.

At its meeting in August, Professor E. S. Salmon and Mr. F. H. Beard reported on the new seedling varieties and upon the other hop investigations being carried out at East Malling.

Mr. W. G. Keyworth, who was appointed in July under a special fund raised by the Kent Branch National Farmers' Union to accelerate the study of the Verticillium Wilt disease in collaboration with Mr. B. S. Furneaux of Wye, and Mr. R. V. Harris of East Malling, gave a report of his progress.

Mr. F. Hinds Coleman drew attention to the prevalence of the disease known to growers as " Nettlehead " or " Eelworm ", which is now believed to be a virus disease.

After a general discussion, the Committee nominated a special Sub-Committee to consider how virus diseases in hops could best be studied and the best means for accelerating investigations thereon. This Sub-Committee, which consisted of Mr. A. Amos, The Chairman and Vice-Chairman of the Kent N.F.U. Hops Committee, Mr. F. Hinds Coleman, Mr. A. Day, and representatives from the S.E.A. College, Wye and East Malling Research Station, was given power to act.

At the time of going to press we are glad to be able to report that the recommendations of this Sub-Committee have received such general support from the Hops Committee of the Kent Branch N.F.U. that arrangements have been made for the initiation of joint investigations early in the new year.

East Malling, Long Ashton and Wye College are all participating and a liaison officer is to be appointed to collaborate with the staffs of the three institutions in studying virus diseases of hops in the South East and West Midlands.

The Fruit Sub-Committee (Chairman, Mr. C. S. Smith) met in September when Mr. R. J. Garner reported on the condition of Newton Wonder apple trees overworked by various methods. The initiation of investigations into the growing of better quality plums and pears was also fully discussed.

A resolution was passed drawing attention to the seriousness of the nuisance caused by dust from stone-crushing operations, and asking the Executive Committee to do everything possible to rectify the matter.

Virus-free Plants Sub-Committee (Chairman, Mr. S. W. Mount). This Sub-Committee was appointed to consider proposals with regard to the raising and certification of virus-free plants. It was agreed that although the idea of a certification scheme was welcomed and that East Malling was prepared to give any technical assistance, the Station should not take the initiative in forming Associations of growers for such a purpose.

The Annual General Meeting and Associate Members' Day.

The Annual General Meeting was held on Tuesday, 21st June. About 100 members attended the Eighteenth Ordinary General Meeting of the Society which was held in the morning at Ditton Laboratory through the courtesy of the authorities and was presided over by the Chairman, Mr. Spencer W. Mount. The Director presented the Twenty-fifth Annual Report and Supplement, the adoption of which was proposed by Mr. A. Amos and seconded by Mr. W. J. Thomas and was formally approved. Mr. T. Neame, Finance Chairman, then presented the Balance Sheet for the year ended 30th September, 1937. Mr. S. R. Dixon proposed and Mr. D. J. Moor seconded the adoption of the Financial Report and this was approved. General Sir Ivor Maxse proposed and Mr. A. T. Miller seconded a resolution that special thanks be given to the Chairman, Director and Executive Committee for securing the Bradbourne Estate and Mansion. With the consent of the Chairman an amendment was proposed and seconded by two Associate Members, Mr. T. Wyldbore and Mr. P. Mursell, that the words "and mansion" be deleted. This found no further support and the resolution was carried.

The Twelfth Annual Meeting of Associate Members was held in the Packing Shed at East Malling Research Station. Mr. Spencer W. Mount, who presided over the company of about 500 members and guests, welcomed The Rt. Hon. the Earl of Feversham, Parliamentary Secretary to the Minister of Agriculture, on behalf of the gathering and referred to the generosity of the Government in making a grant towards the purchase

of Bradbourne. In reply Lord Feversham dwelt on the importance of the work of the Station, comparing the conditions of fruit growing nowadays with those of twenty-five years ago. Mr. Edward Hardy, Chairman of the Kent County Council, proposed a vote of thanks to Lord Feversham and complimented the Station on its work for the industry.

Amongst the guests present at the Luncheon were Captain E. L. Banham, Ministry of Agriculture; Mr. F. J. Du Toit (South Africa House); Mr. W. R. Elgar, Chairman, Kent Agricultural Education Committee; Mr. J. Hillier French, J.P., Secretary of the Kent County National Farmers' Union; Dr. T. H. Harrison (Australia House); Mr. E. H. Havelock, Agricultural Research Council; Sir Albert Howard; Mr. R. E. Montgomery (India House); Mr. F. Ivo Neame, Chairman, Kent County National Farmers' Union; Mr. G. S. Samuel, Ministry of Agriculture; Dr. H. V. Taylor, Ministry of Agriculture; Major Teichman Derville, High Sheriff of Kent; and Mr. W. H. Whitehead, Under-Sheriff of Kent.

In the afternoon the members and visitors were conducted in eight parties to various parts of the experimental plantations. Each of the tours was arranged to include something of most kinds of fruit, although in view of the spring frosts, the crops set were small. Much interest was shown in the differing susceptibilities to frost of varieties of fruits and in the effect of position on the severity of the frost. To facilitate parties reaching the farthest extremity of the Station, a double-deck bus was used and proved a very welcome innovation.

The programme concluded with tea in the Packing Shed.

Finance.

A summary of the Research Account and the Experimental Farm Account for the year 1st October, 1937, to 30th September, 1938, is given below.

Research Account.

1st October, 1937, to 30th September, 1938.

Expenditure.	£	s.	d.
Research and Administrative Salaries and Superannuation	14,840	18	9
Laboratory Expenses and Equipment	1,167	13	1
General Maintenance Expenses	2,805	13	2
Balance (being excess of income over expenditure) ..	7	15	1
	£18,822	0	1
Special Grants:			
Salaries and General Expenses	513	19	8
Balance carried forward at 30th September, 1938 ..	155	17	5
	£19,491	17	2

Income.	£	s.	d.
Grant from Ministry of Agriculture	17,160	14	5
Contributions from Public Bodies	510	0	0
Grants from Membership Fund	399	15	9
Postgraduate Contributions for Laboratory Expenses ..	219	16	7
Contributions from Industrial Bodies	300	0	0
Sundry Receipts	231	13	4
	£18,822	0	1
Special Grants:			
Balance in Hand, 30/9/37 .. 117 17 3			
Less General Account .. 6 10 11	111	6	4
Hop Diseases Investigations (N.F.U.)	75	0	0
Meteorological Investigations (M. of A.)	405	7	9
Walnut Investigations (Donations)	78	3	0
	£19,491	17	2

Experimental Farm Account.

1st October, 1937, to 30th September, 1938.

Expenditure.	£	s.	d.
Farm Valuation as at 30/9/37	10,281	12	8
General Farm Wages ..	6,764	11	3
Manures and Sprays	797	15	10
General Hop Expenses ..	866	1	7
General Expenses	2,560	1	5
	£21,270	2	9

Income.	£	s.	d.
Farm Valuation as at 30/9/38	9,109	7	7
Ministry of Agriculture—Maintenance Grant	1,800	0	0
Sales of Produce and Crops ..	8,788	6	9
Sundry Receipts	193	1	3
Balance (being excess of expenditure over income) ..	1,379	7	2
	£21,270	2	9

The bank overdraft at 30th September, 1938, was £5,677 against a figure of £5,569 at 30th September, 1937.

For the third time in twenty-six years the experimental farm suffered severely from damage by late frosts. Despite this, the Station had its share of fruit, and the sales of produce realized £8,788 as against £10,687 in the previous year. There was, however, only a small crop of apples to be carried forward in store.

On the general running of the farm the expenses were reduced by approximately £2,800 as compared with the previous year.

The continued interest of the Agricultural Committees of the Kent, East Sussex, West Sussex and Essex County Councils, is shown by the renewal of their grants to the Station.

We are glad to report that as a result of the personal efforts of Mr. H. T. Barnett and of Messrs. Gill & Duffus, funds have once again been provided to cover the cost of the walnut work until the spring of 1940.

As mentioned elsewhere, the Kent Branch of the National Farmers' Union provided a special fund to enable the investigations on Verticillium Wilt disease of hops to be accelerated. It is anticipated that this grant will be renewed for at least another year.

The special Sub-Committee of the Ministry of Agriculture which supervised the initial investigations on air flow in its relation to topography, frost occurrence and katabatic winds, recommended that East Malling Research Station should make application for the continuance of these experiments over a further three-year period. A grant for this purpose has been sanctioned.

The Agricultural and Higher Education Committees of the Kent Education Committee approached the Research Station with regard to the development of instruction and demonstrations for rural teachers and biology classes, as well as to assisting with evening lectures. Since it was considered that this was a valuable method of making the Station's findings better known, special arrangements were made for Mr. H. C. Chapelow to undertake this work. The Kent Education Committee have agreed to make a grant to cover the cost of providing our Technical Section with the additional assistance necessary.

A Special Research Grant has been approved for one year from 1st October, 1938, to enable Mr. G. H. L. Dicker to continue his investigations of the Aphididae and other hemipterous insects of species of *Rubus*.

MEMBERSHIP SCHEME.

It will be recalled that one of the objects nearest to Mr. Manwaring's heart was the building up of our Membership Fund, and that, when our Members were circularized with regard to the presentation to be made to him, they were urged to enlist at least one new Member each, so as to bring the number up to 2,000 during the year. Unfortunately, this appeal coincided with the widespread frost damage and the object has not yet been attained. Actually, 61 Memberships lapsed during the year and in addition we regret to record the death of 19 Members. Despite these facts, we registered 143 new Members, and the total on 1st December was 1,420. This was a net increase of 63 over any previous total. If, as we all hope, 1939 proves a profitable season, we are going to ask our Members once again to help us in an especial endeavour to reach the 2,000 mark.

It has been a great encouragement that so many of our Members have not only continued their subscriptions after a series of bad seasons, but that they have generally paid them so promptly each year.

In the statement of accounts appended it should be stated that under the heading of salaries and grants the contributions towards the former have been fully maintained, and the apparent decrease in the figure is due to the completion of a special grant.

While the cost of printing the Annual Report, and of catering for Members' Day has remained approximately the same, the additional expenditure shown under general expenses is accounted for by the greater amount of general propaganda work undertaken.

In addition, the Membership Fund has advanced the capital sum necessary for the Institute's contribution towards the equipment of an up-to-date Insectary and Pathological Glasshouse for virus work, and for the connection of the laboratory and administrative buildings to the main drainage system.

ASSOCIATE MEMBERS' FUND.

Receipts and Payments Account for the Year ending 30th September, 1938.

EXPENDITURE.	£	s.	d.	INCOME.	£	s.	d.
To Contributions to Salaries and Grants	694	5	9	By Balance at 30th September, 1937	2,482	15	2
,, Stationery, Postages and General Expenses ..	254	4	5	,, Donations	55	6	0
,, Part Cost of Printing Annual Report	200	0	0	,, Subscriptions	1,497	9	4
,, Members' Day Expenses ..	118	4	3	,, Sale of Spray Calendars ..	5	7	6
,, Contribution to Capital Expenditure	981	3	10				
	£2,247	18	3				
,, Balance of the Fund at 30th September, 1938	1,792	19	9				
	£4,040	18	0		£4,040	18	0

Development and Endowment Fund.

Whilst our Trustees' land naturally suffered to some extent from frost damage, a considerable amount of produce has been disposed of.

We are glad to state that the Trustees have given their consent to guaranteeing, on the security of their land, a loan of £5,000 from our Bankers, to help us carry on until such time as the full amount asked for in the Bradbourne appeal has been obtained. Once again this fund has been turned to the Station's benefit.

Land and Buildings.

The buildings have been kept in good order, and certain redecorations and alterations to the Plant Physiology laboratory have been carried out. The painting and distempering of the Manwaring and E.M.B. Buildings have been delayed pending the removal of the administrative quarters to Bradbourne. The packing shed on Newgates and the implement shed on Egham Field have been repainted.

Application was made in the spring of 1938 by the Central Electricity Board for permission to erect pylons to carry a new main electric grid across the Station property, and we are glad to report that negotiations were successfully carried through whereby the research plantations were not to be disturbed and the line being planned on an alternative route.

Acquisition of Bradbourne.

It will be remembered that ever since 1935 the growing congestion in the laboratories, library and offices of the Station has been referred to and the difficulties encountered in acquiring new unplanted areas have frequently been mentioned. It was in consideration of these facts that the Committee turned its attention to the possibility of acquiring the mansion and outbuildings at Bradbourne, together with the surrounding 200 acres of land, on the death of Sir John R. Twisden, the last baronet, in November, 1937.

Although Sir Ivor Maxse drew the attention of Associate Members to this acquisition at the last Annual General Meeting, no mention thereof was made in the Annual Report for 1937 since the scheme only developed in the new year. A full statement of the objects which the Committee had in view in acquiring this estate, together with details of what it comprises, are therefore given in this report.

Our Committee were faced with having to solve the following problems :

A. *With regard to buildings.* (1) The growth of the Research activities—particularly in the Insecticide-Fungicide, Pomological and Statistical Sections—necessitated additional laboratory accommodation. It was decided over two years ago, that the administrative offices would have to be removed to make room for these developments. A new administrative wing was therefore planned which, together with necessary adaptations, was to cost £8,000.

(2) The Committee considered at the same time whether better accommodation could not be provided for the Library—which was already congested—and for the numerous visitors, who frequently come in very large parties. The constant alteration and expense involved in clearing out farm buildings and interrupting the normal work

to cater for the large gatherings on quarterly open days, and for the many conferences now held at the Station, have become a serious problem. Unfortunately, it was found that if, in addition, an adequate Library and Conference Hall were to be erected, together with caretakers' quarters, the cost would be approximately £25,000.

(3) The Research Station started on a 23 acre piece of land with no farm buildings or cottages. The Institute has similarly been increased field by field. The farm buildings which have been erected piecemeal have always been inadequate. Moreover, neighbours have, with some justice, complained that the Station, though a big employer of labour, did not own any houses. The problem of maintaining a regular labour staff, so essential on the research orchards, has been greatly increased by the rapid development of quarrying and other industrial ventures in the immediate neighbourhood. Thus, the question of erecting cottages and additional farm buildings has been under discussion for some time. The Bradbourne Estate is well supplied with both.

The need for increased laboratory space and new administrative quarters, for additional accommodation for the library and for quiet study, and for facilities for receiving the increasing number of visitors coming to see the work were all occupying the attention of the Committee when the acquisition of Bradbourne became a possibility.

B. *With regard to land.* The map on the frontispiece well illustrates the serious position a year ago. All those familiar with the work and development of the Station know of the perennial struggle which has gone on to secure here and there pieces of unplanted land for the extension of field work. The last eighteen years have been spent in acquiring under such disadvantageous conditions some 115 acres—which as a whole could have been secured much more easily and reasonably at the outset. The total area utilized by the Station is approximately 160 acres, of which 85 are the property of the Institute, and 30 that of the Trustees of the Development Fund. Twenty-three acres are leased at a peppercorn rent from the Kent County Council, while another 22 acres are hired from private owners. The 60 acres of this land lying to the East of the parish road (approximately 35 owned and 25 leased) have for a number of years been devoted mainly to nursery and to soft fruit trials, whilst the material for new Pear, Plum, and Cherry orchards was being prepared in the light of initial findings. Quite unexpectedly there have been rapid developments both on the immediately adjacent land acquired for quarrying purposes, and in the methods of stone crushing, which has led to much of this land being covered in fine white dust. Not only was the fruit seriously damaged but considerable portions of this area are rendered unsuitable even for experimental nursery requirements. Actually, part of the leased land on which a beginning had been made to develop an isolation hop garden of Golding varieties, and to collect the main walnut varieties, has been bought by quarrying interests, and the Station advised not to plant permanent crops thereon. While this situation was receiving the serious consideration of the Committee, it was obvious, whatever the outcome, that much of the land on that side of the road would have to be abandoned for experimental purposes.

The Fruit Sub-Committee—consisting predominantly of growers—had for some time been pressing for the planting of further apple plantations for specific purposes, but this had been delayed year after year owing to considerations of available space. Again, the small fruit investigations were retarded because of the need for fresh isolation plots which could be kept under the Station's own control.

Whilst it was not visualized that the Research Station would develop at any one time another 200 acres of experimental plantations in addition to its present area, it

was realized that the acquisition of this property would secure the Station's position for all time, so that suitable land at a reasonable price would be available as and when required. Bradbourne had the further advantage of comprising at least three soil series of the Lower Greensand—a truly wonderful asset for a Fruit Research Station.

It has been suggested that this estate is particularly subject to frost damage. Most of the plantable land lies on the same level as the Research Station, though some of it is indeed considerably higher. In the course of twenty-six years East Malling has suffered severe frost damage, in 1927, 1935 and 1938. While Bradbourne suffered much the same fate in these three seasons, there is no reason to believe that as a whole it will be more liable to damage than the Research Station.

When the estate was purchased it was known that it contained a small frost pocket which was actually being used by the Station for the purpose of studying frost conditions and it was hoped in due course to develop these investigations. It should, in addition, be pointed out that such areas can be safely used for the extensive propagation and nursery operations which occupy a considerable area at the Station.

When the opportunity came, then, of safeguarding the land position, and of acquiring house accommodation which could readily be adapted to our urgent requirements, together with fine outbuildings, farm house and cottages for considerably less money than had been estimated for new offices, library and conference room alone, the Committee took the long view and acquired the estate as a whole before it could be broken up into lots for auction.

Being fully aware of the local conditions and of the reputation of Bradbourne as a mansion of exceptional historic and artistic value, the Committee felt confident that, in taking this action in the best interests of the Station, they would also be assured of wide support on these aesthetic grounds. An immediate grant of £2,500 from the Pilgrim Trust and the warm recommendation of the appeal by the National Trust have already justified this expectation.

The advantages for an Institution such as ours (with its ever-growing academic and social activities) of acquiring a headquarters such as Bradbourne were only too obvious. The Research Staff need a quiet place in which they can keep abreast with the literature of their subject and hold those invaluable staff discussions which are a feature of the Institute. Bradbourne, being a short distance from the laboratories, affords just the right atmosphere in which the staff can go to read and discuss their problems undisturbed.

We should like to record our thanks to Mr. Walter Elgar, of Messrs. G. Webb & Co., of Sittingbourne, who, with Mr. F. Miskin, of Messrs. Bracher, Son & Miskin, Maidstone, negotiated and completed the purchase.

The Bradbourne Appeal.

In order to make this acquisition possible, it was realized that, although the Ministry of Agriculture generally approved the scheme and might be prepared to give a grant in aid, it would be necessary to raise £ for £ in the case of such capital expenditure. A small Appeal Committee was formed, including Mr. A. C. Bossom, M.P., Sir Bernard Greenwell, Bt., Col. C. Ponsonby, M.P., and Sir Stephen Tallents, to whom our best thanks are due for many helpful suggestions and introductions. In due course appeal letters appeared in *The Times* and provincial Press over well-known signatures, which

stressed the value of the Station's work and the advantages of acquiring and preserving the estate. The appeal was given a splendid lead by a grant of £2,500 from the Pilgrim Trust for the purpose of preserving the mansion, and also by a donation of £1,000 from our old friend Sir Bernard Greenwell.

Lord Camden, to whom we are most grateful, espoused the cause in Kent, and in October he invited a number of people in the County likely to be interested to a luncheon in the Great Hall at Bradbourne, when a further appeal was launched. In addition to His Lordship, Dr. H. V. Taylor, representing the Minister of Agriculture, Mr. Bossom and Sir Frederick Keeble spoke on different aspects of the project. Although this event was unfortunately overshadowed by the international crisis, the gathering was described by Sir Charles Igglesden as " one of the most influential ever held in the County ". Our best thanks are due to Sir Charles for his help in connection with the appeal.

No mention of Bradbourne is complete without a reference to Sir Herbert Baker, of Owletts, Cobham, Kent, who was one of the first to encourage the scheme. Sir Herbert's interest in ancient buildings is well known, and when in the early stages of the negotiations he offered to give his advice on the possibility of adapting the mansion for administrative headquarters, and on the condition of its timbers, it was with gratitude that his offer was accepted. Subsequently the Committee, with the encouragement of the Society for the Preservation of Ancient Buildings, found it possible to retain the services of Sir Herbert and his colleagues to guide the work of adaptation and repair.

In view of the general situation in the industry no direct appeal was made to fruit growers, though a number of individual growers, and branches of the National Farmers' Union, including Biddenden, East Sussex, Dartford, Faversham, Lamberhurst, Maidstone, Marden, Paddock Wood, Sevenoaks and Sittingbourne, have already responded most generously. Before the end of the year a sum of £7,042 had been raised from private sources in amounts varying from £1,000 to 1s. We gratefully acknowledge also the gifts in kind which have already been presented to the Station to assist in maintaining the amenities of the old house. Sir Herbert Baker has presented a fireback, designed by himself, for the Great Hall, our Chairman secured the old grandfather clock for the Committee Room, and the staff the old grand piano to serve at social gatherings. Some of the books from the Bradbourne library have also found their way back.

The Kent Archæological Society, to whom all the interesting family portraits were bequeathed, have agreed at the invitation of our Committee, to leave these on the walls of the Great Hall.

During the present year the effort to raise the rest of the sum required will be maintained, and it is hoped the building will be ready for occupation at the end of the summer.

STAFF.

Dr. W. A. Roach left for Stellenbosch, South Africa, in August for a period of twelve months to carry out further investigations with his injection methods. After his return, we hope to welcome Dr. J. Reynecke from the University of Stellenbosch, South Africa.

We have been fortunate in having the voluntary assistance of Major S. G. Thompson, M.C., M.A., T.D., who had been studying spectroscopic methods under Dr. Roach, and who is continuing this work in his absence abroad.

We congratulate Mr. T. N. Hoblyn on being appointed a recognized teacher of the University of London.

The Staff Council re-elected Mr. M. H. Moore as their representative on the Executive Committee for the year, and Mr. T. N. Hoblyn was elected Secretary of the Council.

Mr. C. E. Cornford, B.Sc., A.R.C.S., who had made the Research Station his headquarters during his preliminary investigations into the climatological conditions connected with frost damage, has now joined the Institute's staff. We wish him continued success.

We were pleased to welcome in July last Miss M. E. King, B.A.(Cantab.), who has been appointed to assist in the investigations on the virus diseases of small fruits. Miss King worked for some weeks in 1935 and 1936 in the Plant Pathology Section, and her appointment followed a year's stay in Australia, where she had been studying under a Research Studentship.

Mr. W. G. Keyworth, B.Sc., A.R.C.S., was appointed in August last with the aid of a grant from the Kent N.F.U. to develop the investigations upon the Hop Verticillium Wilt Disease in collaboration with Mr. B. S. Furneaux of Wye, and Mr. R. V. Harris. We extend him a hearty welcome.

We congratulate Mr. G. H. L. Dicker, B.Sc., A.R.C.S., on being awarded a grant by the Ministry of Agriculture to continue his investigations on insects infesting the raspberry, loganberry and blackberry.

The Ministry of Agriculture, having approved recommendations for dealing with the pressure of work in the Technical Section, Mr. B. F. G. Levy, B.A.(Cantab.), Hort. Cert.(Reading), has been appointed as assistant to Mr. N. B. Bagenal.

Mr. R. A. Ward, who had been assisting the Marketing Officer, left in October on securing an appointment with the Medway Catchment Board ; he has our best wishes for the future.

We were sorry to lose Miss L. F. R. Owen, who had been appointed to the Administrative Staff in December, 1937, and we welcome Miss H. D. Gilmore in her place.

Messrs. R. Blunden and W. A. J. Bourne were appointed as laboratory assistants during the year in the place of Messrs. F. R. Usmar and J. J. Humphreys, and we wish each one success in their new work.

Special thanks are due to the staff for the efficient management of the Library, the Photographic and the Greenhouse Sections through special Sub-Committees, of which the Chairmen were Dr. H. Shaw (*vice* R. V. Harris), Dr. W. S. Rogers, and Dr. A. M. Massee respectively.

Mr. D. Akenhead, the Deputy Director of the Imperial Bureau of Horticulture and Plantation Crops, and his staff have continued to render invaluable assistance in the Station's library.

During the international crisis in September, the staff formed a committee to deal with Air Raid Precautions so far as the Institute and its irreplaceable records were concerned. The Secretary undertook the co-ordination of these activities.

Postgraduate and Overseas Workers.

During 1938 we have had thirteen long-period and eight short-period students working here, six of whom are still with us. Seven members of staff and six post-graduates have been registered here as candidates for higher degrees in the University of London, and one post-graduate was registered as an internal student of the University.

Congratulations to Dr. H. Hill, of the Central Experimental Farm, Ottawa, who had been studying here since September, 1936, under the scheme of exchange of workers with the Dominion of Canada, and who was awarded a Ph.D. (Plant Physiology) degree in June for his thesis on Nutritional Deficiencies. Dr. H. Hill left us in July to return to his duties in Ottawa, taking with him the best wishes of all the staff. Miss B. Tornerhjelm returned to Sweden in September after twelve months of strenuous voluntary work in the Pomology Section for which the Station is grateful. We take this opportunity of congratulating Mr. R. D. Wickham, of Gate House, Brenchley, on his engagement to Miss Tornerhjelm. They were married in January, 1939. Mr. W. F. Walker returned to Tasmania in October after successfully passing his N.D.H. Examination. Mr. Walker was closely associated with Mr. Garner in his framework grafting experiments and in collaboration with him was responsible for the Occasional Paper No. 5, " The Frame-working of Fruit Trees ", published last April by the Imperial Bureau of Horticulture and Plantation Crops. We take this opportunity of expressing to Mr. Walker the thanks of the Station for the many services he rendered during his year's stay here.

Mr. Bhola Nath Lal (Benares University) left us in December to carry out the second part of his Ph.D. thesis work at Rothamsted, by arrangement with Dr. Crowther. During the year in which Mr. Lal was associated with the Biochemistry Section here he took a great interest in the general activities of the Station and we all wish him the best of luck in his examination and in his future career. Miss M. G. Webb left us in October to undertake work as a professional horticulturist and we extend to her our best wishes for a successful career. Mr. H. B. Cannon from the Central Experimental Farm, Ottawa, and Mr. R. J. Hilton from Macdonald College, Quebec, are now in the second year of their thesis programmes, and have already contributed valuable information in the course of their studies. Dr. F. Majewski (Poland) left us in August to undertake some intensive laboratory investigations in biochemistry at the Imperial College of Science and Technology by arrangement with Prof. A. C. Chibnall. Dr. Majewski during his six months' association with Dr. Roach rendered valuable service to the biochemistry section in regard to the spectrographic investigations. Mr. T. Remiszewski (Poland) left us in December owing to a breakdown in health. His enthusiasm and energy during the short time he was with us were most marked, and it was a disappointment to us that his illness cut short his stay.

We received short visits from the following : Mr. M. Mocquot (France), Mr. V. Vitolovic (Yugoslavia), Dr. R. M. Smock (Canada), Dr. C. Barnard (Australia), Mr. P. C. Bick (South Africa), Mr. C. J. Hickman (England), and Miss R. F. Stern (England).

The following long-period students arrived in 1938 : Mr. F. C. H. Gayner, M.A., (Cambridge), who is interesting himself in problems of pear culture, Mr. Adya Charan Sinha, B.A. (Agricultural College, Cawnpore), and Mr. A. E. Pound, B.Sc. (Reading), who are working on problems connected with the vegetative propagation of rootstocks.

Staff Meetings for Research Discussions.

Nine full Staff Meetings were held during the year, when the progress made with certain of the problems in the research programme was explained in some detail by those members of Staff particularly concerned. The discussions engendered were very satisfactory. Particular interest was shown in the experiences of our Chairman, Mr. Spencer Mount and of Mr. T. N. Hoblyn, who spoke on " Horticultural Research in the New World ", and we would express our thanks to Mr. Mount as our guest speaker on this occasion, and to Mr. J. M. Robertson, who contributed to the discussion. The epidiascope, purchased last year, has been invaluable at these meetings and was employed on every occasion.

Social Activities.

The Christmas Supper Party and Concert was held on the 9th January. The numbers were almost the same as last year and the evening was greatly enjoyed by all. As last year, Hastings was the objective for the Annual Summer Outing on the 9th August and this year a visit was paid, on the way down, to the Pinetum at Bedgebury Park. The County Cricket Match, the Swimming Pool and games on the Cliff all contributed towards an excellent day.

During the winter months the Literary and Dramatic Society held frequent meetings which were all well attended. The Amateur Photographic Club has now entered on its second year and is providing a useful spare time activity for members of staff.

A men's hockey team, representing the Research and Advisory Service in the County and including members of the Staffs of Wye College, Borden Farm Institute and this Station, met a team of fruit growers under the leadership of Mr. J. W. S. Mount. The match, played one evening in April on the Malling Hockey Club's ground by kind permission of that Club, was most enjoyable, and the Research and Advisory workers did very well to hold their strong opponents to a draw, 2—2. It is to be hoped that the fixture will become an annual one. Tennis proved to be very popular this season. We were able to secure the services of a professional coach on three occasions and his visits were well supported. A Singles Handicap Tournament was played off and resulted in a win for Miss E. C. Thompson for the second year in succession. The Cricket Club played thirteen evening games, mostly against teams in which associate members of the Station are prominent. Five of these games were won and seven were lost. The formation in the autumn of a Badminton Club among the members of staff has provided facilities for play on one evening a week in the Badminton Hall, West Malling. Owing to the limited number of hours for play it has been found necessary to restrict club membership to twenty and this unfortunately has led to the refusal of membership to a number of people. Enthusiasm in the Club fully justifies its existence.

Collaboration.

Pomology and General.

The mosaic-free raspberry cane nurseries at the County Farm Institutes of Kent, East and West Sussex and at the University of Reading Farm, Shinfield, were visited and rogued. The daughter nursery of clonal strawberries at the East Sussex Farm Institute was inspected and found to contain some very promising young stock.

Mr. M. B. Crane, of the John Innes Horticultural Institution has collaborated in cytological investigations of old and new varieties of apple growing on their own roots.

Investigations on low temperature injury to the blossoms of apple and blackberry were carried on in the Ditton Laboratory, and we are much indebted to the workers there for their co-operation in the loan of low-temperature chambers as well as for their helpful advice.

A manurial trial with hops is being carried on in collaboration with Mr. A. H. Burgess of Wye.

A final consignment of loganberries and blackberries was sent to Mr. F. Hirst of the Campden Fruit Preservation Station in connection with the canning trials commenced two years ago.

As in the previous year seeds from selected clonal pear rootstocks were again supplied to the Department of Agriculture and Forestry, Pretoria, South Africa, in continuance of the joint experiments on the germination of pear seeds.

In February the Marketing Section undertook on behalf of the Ditton Laboratory the packing and marketing of some 1,200 bushels of Cox's Orange Pippin from a gas storage experiment. Assistance was also provided on occasion in the preparation and disposal of fruit connected with other storage experiments.

Plant Breeding and New Varieties.

The joint work in the testing out of new seedling hop varieties is still proceeding in collaboration with Professor E. S. Salmon and Mr. A. H. Burgess of Wye College. The breeding of new races of apple rootstocks resistant to Woolly Aphis and of new strawberry varieties for pomological and pathological tests has been continued with the collaboration of Mr. M. B. Crane of the John Innes Horticultural Institution.

Horticultural Meteorological Investigations.

Professor Brunt of the Imperial College of Science and Technology has given much help and advice in the development of these studies and we have gratefully welcomed his visits to the Station. Mr. E. G. Bilham of the Meteorological Office, Air Ministry and Mr. E. L. Davies of the Meteorological Department, Experimental Station, Porton, have maintained their interest and guidance in these investigations and the Instruments Department has lent us certain most useful apparatus. During the summer Mr. C. E. Cornford spent two weeks at Long Ashton where he studied the influence of altitude and vegetation on air temperature.

Physiology.

The traditional close collaboration with the Plant Physiology Research Institute of the Imperial College of Science and Technology, London, which has been so valuable in recent years, has been maintained through Dr. H. L. Pearse, who, as a member of the staff of the Imperial College continues to give his full time to research in the section at East Malling.

Dr. L. G. G. Warne of the Botanical Department, Victoria University, Manchester, has collaborated by investigating the water-conductivity of the trunks of eighty-four double-worked apple trees supplied by the section and has published the results.

Biochemistry.

Dr. W. A. Roach is spending a year in South Africa, collaborating with Dr. S. M. Du Toit, Director of Fruit Research, Stellenbosch-Elsenburg College of Agriculture, on deficiency problems of fruit in South Africa. In collaboration with Messrs. W. G. Kent, C. R. Thompson and J. B. Duggan, the Kent County Fruit Advisory Officers, the chemical differences between healthy and unhealthy trees have been studied by the spectroscopic method. Mr. Duggan has also been co-operating with the section in testing the possibilities of injection methods in commercial practice and has carried out injections at nine different centres.

Plant Pathology.

In collaboration with Dr. G. H. Berkeley of the Dominion Laboratory of Plant Pathology, St. Catharine's, Ontario, imported Canadian peaches have again been examined for incidence of disease, particularly Brown Rot, in relation to various treatments. Messrs. R. V. Harris and W. G. Keyworth have collaborated with Mr. B. S. Furneaux of Wye College in a study of soil conditions in relation to the Verticillium disease of hops. Strawberry plants have been received from Sussex, the Scilly Isles, Ireland and Canada for examination in the greenhouse for virus content.

Entomology.

The testing for resistance to Woolly Aphis of new seedling rootstocks for apple has been continued in conjunction with Mr. M. B. Crane of the John Innes Horticultural Institution.

Insecticides and Fungicides.

The Fuel Research Station, Greenwich, and the Gas Light and Coke Co., Ltd., supplied further quantities of tar distillate in connection with the survey of ovicidal properties that is being made by Dr. H. Shaw and Mr. W. Steer. Messrs. Technical Products, Ltd., and Imperial Chemical Industries, Ltd., have again supplied the materials for several investigations.

Outside Trials.

The Pomology Staff has maintained the collaboration with Mr. B. S. Furneaux of Wye College and the County Horticultural Staff, in connection with the small experimental plots established on various farms as a consequence of the Soil Surveys. Further records have also been taken on the Cherry Rootstock trials for sweet cherries at Spriver's Farm, Horsmonden, and for Morellos at Nichol Farm, Teynham.

The runner beds established by Mr. Arthur Amos and Mr. G. C. Johnson from our clonal strawberries are still being regularly inspected and rogued; similar visits have been paid to the Mosaic-free Raspberry Cane Nurseries that have been set up on Mr. Neame's and Mr. Amos' farms.

Mr. Steer has made further Codling Spraying Trials at Nichol Farm, Teynham. In the Mycology Section, Mr. W. G. Keyworth, in conjunction with Mr. B. S. Furneaux

of Wye College, has made an intensive study of the Hop Verticillium Wilt disease in hop gardens in various parts of Kent, especially on farms in the Paddock Wood area ; in particular observations are being made on the influence of local conditions on the incidence of the disease.

We should like to take this opportunity of expressing our most grateful thanks to the owners of the plantations and orchards on which these outside trials have been carried out and for their hearty collaboration in making them a success.

Advisory Work.

Correspondence.

Enquiries answered by letter during the year numbered 1,642, of which 452 came from Kent, 114 from Sussex, 76 from Essex, 49 from Surrey, 678 from other parts of the United Kingdom and 135 from overseas. Growers continue to make frequent use of the telephone for the purpose of making enquiries, especially during the spraying season. An analysis of the year's enquiries shows that 992 were classed as Pomological. Of these 160 dealt with small fruits, 115 with rootstocks, 93 with propagation. Of the 238 enquiries devoted to diseases, fungal and bacterial, 33 dealt with scab, mildew and canker, 30 with raspberry and 28 with strawberry diseases. Of the 200 enquiries dealing with insect pests 28 were concerned with various lepidoptera, 25 with aphides, and 24 with gall mites.

Visits.

Members of staff paid 157 advisory visits during 1938, of which 129 were made in Kent. We again express our thanks to Mr. W. G. Kent and Mr. C. R. Thompson, of the Kent Education Committee, to Mr. R. Hart and Mr. J. B. Duggan, of the Kent Farm Institute, and to Mr. B. S. Furneaux, of Wye College, for their close collaboration in the matter of field visits. Mr. Kent and Mr. Thompson have paid 597 visits in the county during the course of the year. As mentioned elsewhere in this report, Mr. Furneaux has rendered valuable service to the Station in the course of the year in regard to various soil problems. Dr. W. S. Rogers and Miss M. E. King made a tour of soft fruit areas in the West of England in October to investigate the position there in regard to strawberry diseases, and to seek out possible sources of supply of healthy strawberry varieties.

The services of members of staff have been given as judges at the following commercial fruit shows : The Imperial Fruit Show (Bristol), East Kent Commercial Fruit Show (Ashford) and the Ashford Cattle Show (Fruit Section). Mr. H. C. Chapelow again visited the Southport Show in August at the request of the Secretary of the Advice Bureau, and was in attendance throughout the Show in an advisory capacity.

Lectures, Demonstrations and Conferences.

Lectures.

Twenty-three lectures were given by members of staff during the year, eighteen of these being given under the Ministry of Agriculture Extension Scheme. In addition Mr. Chapelow gave fifty-one popular lectures by arrangement with the Kent Education Committee.

Demonstrations and Open Days.

About 400 fruitgrowers attended an Open Day held on 30th March. In the morning a comparative trial was made of double- and triple-nozzle lances and a trigun. The time taken to spray a set of twenty Bramley's apple trees, 20 years old, planted about 24 feet square, and the amount of spray used with each type of lance, was recorded by Mr. J. Turnbull, of the Ministry of Agriculture, and Mr. M. H. Moore. As a result of the trial it appeared that the ideal quantity of spray required by trees of that size was about $3\frac{1}{2}$ gallons per man per minute, and that this was best obtained by using triple-nozzle lances with 4/64th in. discs and 400 lb. per sq. in. pressure. In the afternoon, parties were taken to demonstrations of the latest methods of framework grafting apples, pears and plums given by Messrs. R. J. Garner, D. H. Hammond and W. F. Walker. The programme concluded after tea with the showing of some sound and silent films on fruit growing; this was well attended in spite of the rather close atmosphere that inevitably resulted from the darkening of the small packing shed.

On the 22nd June an Open Day was held for residents in the locality, when some seventy-five people made a conducted tour of the laboratories and experimental plantations. Members of staff were in attendance to explain the nature of the researches undertaken at the Station and how the fruitgrowers' problems are attacked.

The Experimental Hop Gardens were open to inspection by growers on the 31st August, when special attention was paid to some of Professor Salmon's new varieties that appear to be resistant to "Nettlehead". The effect of various methods of pulling, cutting and stopping of leading growth, etc., was seen in a number of cultural trials.

A Pear Day was held on the 7th September and attracted about 150 fruitgrowers. During the morning the party was conducted through the experimental plantations of pears and was addressed by Dr. Hatton and the members of staff concerned with the experiments. In this way every aspect of pear growing was dealt with, special attention being given to rootstocks, varieties, pruning and the problem of non-setting of blossom. The afternoon was devoted to a discussion on "Should we grow more Pears?" Mr. T. Neame was in the chair and Sir Edgar Jones opened the discussion. Sir Edgar was keen that more pears, especially Williams (Bartlett), should be grown so that the canning industry in this country could be supplied with suitable pears. A lively discussion ensued, to which many pear-growers contributed, and it appeared that there was plenty of scope for growing more pears provided suitable situations could be found.

Throughout the grafting season Mr. R. J. Garner gave numerous demonstrations of frame-working to members and visitors at the Research Station. He has also demonstrated the methods when visiting growers and gave practical demonstrations of frameworking methods following lectures in West Sussex and Berkshire. On a number of occasions Mr. Garner demonstrated propagation technique to visitors at the Research Station.

At the request of the N.F.U. Headquarters Fruit Sub-Committee a conference on Spring Frost Damage to Fruit in 1938 was organized on the 30th November. Some 200 visitors attended the conference which was held in the small packing shed under the chairmanship of Dr. H. V. Taylor. A number of papers were read by various experts and the experiences of leading fruitgrowers in different parts of the country were given. A full report of the conference was afterwards published in the *Kent Farmers' Journal*, January 1939.

Conferences, etc.

Dr. A. M. Massee and Mr. R. M. Greenslade attended a meeting of the Association of Applied Biologists in March and a meeting of the Wye Provincial Conference at Swanley in July. Dr. H. Shaw and Mr. W. Steer also attended this Conference. In August the Director, Dr. H. L. Pearse and Dr. W. S. Rogers attended the twelfth International Horticultural Congress at Berlin, to which Dr. Hatton and Dr. Pearse contributed National reports. In addition, the Director acted as the General Reporter for section 5 of the Congress on Nurseries, which entailed the summarizing of eighteen National reports. Miss M. E. King and Dr. W. S. Rogers attended the Cambridge meeting of the British Association in August and while there attended a Virus Conference at which Mr. Greenslade was also present. In October Dr. H. Shaw attended a meeting of the Society of Chemical Industry (Food Group) and read a paper on " The Problem of Spray Residues on Orchard Fruit ". Miss M. E. King attended a meeting of the British Mycological Society in November. Four members of staff attended and spoke at a meeting of the Wye Provincial Conference at Wye in November. Mr. H. M. Tydeman attended a meeting of the Association for the Study of Systematics in Relation to General Biology in London in December. Mr. R. M. Greenslade and Mr. W. Steer attended the Conference of Advisory Entomologists in London in December. Dr. A. M. Massee, Dr. W. S. Rogers and Miss M. E. King read papers at a Strawberry Conference held at Wisbech in December under the auspices of the Wisbech Fruit-Growers Association. Various members of the pathology staff attended a meeting of the Association of Applied Biologists in December, and contributed to the discussion. Members of staff interested in the Hop Research Programme met those similarly interested at Wye College in December to discuss future plans.

Dr. Massee and Mr. Greenslade regularly attended the meetings of the Royal Entomological Society in London throughout the year. Dr. Shaw attended meetings of the Society of Chemical Industry and of the Association of Applied Biologists during the year.

Dr. H. Wormald has again served on the Council of the British Mycological Society and on the Council of the Association of Applied Biologists. He has also assisted with the editing of the Transactions of the British Mycological Society.

Dr. H. L. Pearse has accepted an invitation to serve on the Plant Hormone Committee, and attended a meeting of this committee held at Kew Gardens in November. Dr. A. M. Massee and Dr. H. Shaw have served on the Insecticides and Fungicides Committee of the Agricultural Research Council and Dr. Shaw has also served on the Technical Sub-committee on Tar Oil Washes of the Association of British Insecticides Manufacturers.

The Director has been re-appointed to the Board of Studies in Horticulture of the University of London and has also served on the Higher Degrees Sub-Committee of the Board and on the Board of Examiners for B.Sc.(Hort.) degree.

He has served on the Ministry's Horticultural Advisory Council and its sub-committee dealing with the raising and certification of virus-free plants. He has also served on its special sub-committee directing the Horticultural Meteorological investigations. He is a member of the Research and Advisory Committee of the South-Eastern Agricultural College, Wye, and of the Council of the Horticultural Education Association and he has attended meetings of both.

At the International Horticultural Congress in Berlin Dr. R. G. Hatton was appointed to a special sub-committee to deal with the possibilities of reaching an international agreement on the classification and nomenclature of rootstocks.

Exhibits.

We again exhibited at Chelsea this year and showed some double-worked apple trees which demonstrated the "Source of Rootstock Influence". At the County Agricultural Show, Folkestone, we co-operated with the County Agricultural Authorities in their exhibit "Orchard Planning". This was also staged at the Tunbridge Wells and South-Eastern Counties Agricultural Show. A loan exhibit on stub-grafting and inarching was sent in June to the Sussex County Show, and this was also staged at the Larkfield Cottage Gardeners' Show held at Bradbourne in August.

At the Gillingham Municipal Show we staged an exhibit showing various aspects of Fruit Growing Research. At the Oxford Summer School for the Men of Trees Society, at which Dr. W. S. Rogers read a paper, an exhibit was staged showing the results of his observations on Fruit Tree Roots. A loan exhibit consisting of plants of *Fragaria virginiana* and *Fragaria chiloensis* was sent to the Dublin Spring Show in March at the request of Mr. G. O. Sherrard of the Albert Agricultural College.

At the request of the Ministry of Agriculture we co-operated with Dr. H. V. Taylor and with Long Ashton in the planning of a comprehensive exhibit showing the part played by research in improving methods of fruit production. This exhibit was staged by the Department of Overseas Trade at the Empire Exhibition in Glasgow (May to November).

An exhibit illustrating results of our experimental work was staged in the Drawing Room at Bradbourne on the occasion of the luncheon given there by Lord Camden in October.

Visitors.

A total of 3,248 visitors was recorded for the year 1938, including fifty-seven organized parties and some 190 visitors from overseas. In addition some 300 visitors were shown over Bradbourne. We were specially honoured in May by receiving a visit from the members of the Linnean Society on the occasion of their 150th Anniversary Celebrations. We were glad to welcome a party from the Royal Meteorological Society here in July under the leadership of their President, Dr. Keen, and a programme of papers and tours in the experimental plantations was arranged for the occasion. Members of the Imperial Forestry Institute, Oxford, came here for a day in June. A party of Members of the Planters' Group of the Royal Empire Society visited us in July, and were particularly interested in Dr. Rogers' root studies and in Dr. Roach's work on injection. A party of French fruitgrowers and nurserymen visiting England on a visit organized by the French State Railways spent the morning of the 19th October walking round the Station and many useful contacts were made. We were glad to welcome the South-Eastern Federation of Beekeepers' Associations again on the occasion of their annual conference last July. The members were shown round the Station in the morning and held their conference in the packing shed in the afternoon. In August we had the pleasure of welcoming Dr. P. W. Zimmermann who came at the invitation of the Imperial Bureau of Horticulture and Plantation Crops in conjunction with our Physiology Section to give a talk on the work of the Boyce Thomson Institute (U.S.A.) in regard to growth-promoting substances.

In September the Horticultural Education Association held their Annual Conference here when three enjoyable days were devoted to a thorough survey of the most important parts of our research programme. County officers from all over the country were conducted in organized parties to different parts of the experimental plantations where talks were given by members of Staff. Much valuable interchange of opinion took place, old contacts renewed, and new friendships made.

The usual periodical visits throughout the year were paid by students from Wye College, Kent Farm Institute, and Swanley College. Other students' parties included Reading University, Oaklands Farm Institute, Hertfordshire, Waterperry House Horticultural School, Oxford and the Kent Agricultural Day Class. Mr. Chapelow has continued his series of classes for schoolmasters under the arrangement with the Kent Education Committee mentioned earlier in this report. Eighteen of these classes were held at the Station during the year, and three parties of schoolchildren were shown round by Mr. Chapelow.

Distribution of Rootstocks and Experimental Material.

Rootstocks.

There has been a falling off in the demand for rootstocks during the year. This is thought to be due in part to the slowing up of planting brought about by unfavourable seasons. There has, however, been an increase in the number of requests received from overseas. Twenty-four countries have received consignments of experimental material varying in quantity from a few dozen specimens up to twelve thousand. In all some 300,000 rootstocks were distributed.

Trees and Bushes.

One thousand and seventy-eight pedigree trees and seven thousand five hundred clonal currants and gooseberries were sent out in small lots to education, demonstration and research centres and to our members. The demand for clonal bush fruits far exceeded the supply in almost every variety in our list.

Strawberries.

Once again the demand for our clonal stock of Royal Sovereign plants from rogued " isolated block " runner beds has exceeded the supply and it was necessary to close the list of applicants prior to the lifting season. During the spring we sent out ninety-eight thousand clonal Royal Sovereign and thirteen thousand clonal Tardive de Leopold. In addition we distributed one hundred and forty-seven thousand clonal Royal Sovereign from our daughter nurseries. Three hundred and ten thousand clonal Royal Sovereign were lifted from plots at the Station and sent out during the autumn. Thus 1938 has seen a total distribution of five hundred and sixty-eight thousand plants. Even so we have been unable to send to many who applied late in the season.

Small consignments have been sent to India, Ceylon, Australia and Tasmania.

Hops.

Owing to the growers' acreage being limited under the Hops Marketing Board Scheme, any new plantings by growers must be balanced by the grubbing of gardens. Growers are therefore naturally rather reluctant to plant the new varieties when they are getting good prices for the established sorts. Nevertheless, there is a moderate demand

for rooted sets of the named seedlings. The demand for sets of Brewers' Favourite (OP21) has been particularly good this year.

Fruit.

Fruit for storage, canning, and other trials has again been supplied to Ditton Laboratory, and the Fruit Preservation Research Station, Campden.

Trays of apples were also sent to the Worshipful Company of Fruiterers for inclusion in their presentation of fruit to the Lord Mayor in October.

STATION'S PUBLICATIONS.

Fifty scientific papers and three bulletins of a popular nature were published during the year; the titles and summaries of these papers appear in the Annual Report. A certain number of sets of the Annual Report from 1924 to 1937 inclusive (excluding 1927 and 1934) are available on application to the Secretary. A complete list of available publications, together with their price, can also be obtained from the same source.

Journal of Pomology and Horticultural Science.

The Executive and Editorial work has continued to be carried out from East Malling by Professor B. T. P. Barker and Dr. R. G. Hatton as Joint Editors, with Dr. G. H. Pethybridge acting as Assistant Editor.

LIBRARY.

To the Research Station Library, 1938, has brought the promise, if not the realization, of a new era. The acquisition of Bradbourne and the allocation to the Library of a substantial portion of the accommodation it offers suggest that the period of chronic congestion is approaching its close. In these circumstances, major changes in the arrangement of the Library have not been undertaken, but the prospective accommodation has been surveyed and a Sub-Committee appointed so that plans may be prepared in anticipation of the removal.

A welcome addition to the resources of the Library is the grant that has been made of £1 per annum from the bench-fees of each postgraduate worker. The hope expressed a year ago has thus quickly become an accomplished fact. While, however, this arrangement relieves to some extent the financial position of the Library, only a favourable revision of the basic grant can wholly solve the problem of finance and enable the Committee adequately to discharge its function.

During the year, the Library has been singularly fortunate in the number of books acquired by donation. Grateful acknowledgment is made of the following gifts: a collection of forty-two volumes, mainly on tropical agriculture, from Mr. H. Hamel Smith, and books from Mr. S. Kennedy North, from Miss A. B. Beakbane and Mr. N. B. Bagenal, jointly, and from the Bradbourne Library. Mr. Bagenal now also presents to the library each quarter the periodical " Sight and Sound ".

HEADLEY BROTHERS
109 Kingsway, London, W.C.2
and Ashford, Kent